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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/029,204	12/28/2001	Kenji Shimizu	Q63141	5380

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EXAMINER

BERNATZ, KEVIN M

ART UNIT	PAPER NUMBER
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1773

DATE MAILED: 12/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/029,204

Applicant(s)

SHIMIZU ET AL.

Examiner

Kevin M. Bernatz

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8,10,12-17 and 19-29 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 27-29 is/are allowed.
- 6) ☒ Claim(s) 1-8,10,12-17 and 19-25 is/are rejected.
- 7) ☒ Claim(s) 26 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date. 12162005.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Response to Amendment

1. Amendments to claims 1, 16 and 20 and addition of claims 26 - 29, filed on October 8, 2005, have been entered in the above-identified application.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Request for Continued Examination

3. The Request for Continued Examination (RCE) under 37 CFR 1.53 (d) filed on October 8, 2005 is acceptable and a RCE has been established. An action on the RCE follows.

Claim Rejections - 35 USC § 103

4. Claim 26 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 2, 17 and 21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 2, 17 and 21 recite the limitation "the material with a structure having no magnetic domain walls". There is insufficient antecedent basis for this limitation in the claim. For the purposes of evaluating the prior art, the Examiner has interpreted these claims as requiring 'at least one of the soft magnetic layers comprises a material selected from ...'.

Claim Rejections - 35 USC § 103

7. Claims 1 – 8, 10, 12 - 14, 16, 17, 20, 21, 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. (U.S. Patent No. 6,468,670 B1) in view of Shukh et al. (U.S. Patent App. No. 2002/0028357 A1) and Akiyama et al. (U.S. Patent No. 5,815,342).

Regarding claims 1, 16 and 20, Ikeda et al. disclose a magnetic recording medium (*Title*) comprising, in sequence, on a nonmagnetic substrate (*Figure 1*, "*Substrate*"), at least one soft magnetic layer ("*soft underlayer*"), an orientation control layer ("*NiAl*"), a nonmagnetic intermediate layer ("*Ti*"), and a perpendicular magnetic layer having an axis of easy magnetization which is oriented mainly perpendicularly to the nonmagnetic substrate ("*CoCr granular layer*" and "*Co/Pt multilayer*" and col. 2, lines 6 – 41).

The limitation(s) “wherein said orientation control layer is provided to control the orientation of the perpendicular magnetic layer” and “said nonmagnetic intermediate layer is provided ... to improve the orientability and the coercive force of the perpendicular magnetic layer” are (an) intended use limitation(s) and are not deemed further limiting in so far as the structure of the product is concerned. Note that “in apparatus, article, and composition claims, intended use must result in a **structural difference** between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. ***If the prior art structure is capable of performing the intended use, then it meets the claim.*** In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art.” [emphasis added] *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963). See MPEP § 2111.02. In the instant case, Ikeda et al. teach that these layers are provided to encourage the perpendicular crystalline anisotropy of the magnetic layer and, therefore, the Examiner deems that the disclosed layers meet the claimed intended use limitations.

The nominal apparatus element “a magnetic head for carrying out recording and reproducing of information to and from the magnetic recording medium” is disclosed by Ikeda et al. (*col. 3, line 24 bridging col. 4, line 7*).

Ikeda et al. fail to disclose a soft magnetic underlayer meeting applicants’ claimed limitations.

However, Shukh et al. teach a soft magnetic layer meeting substantially all of the claimed limitations, except the direction of magnetization of the soft magnetic layers, wherein the use of such a soft magnetic underlayer overcomes the noise and write field degradation associated with other types of soft magnetic underlayers (*Paragraphs 0007 – 0010; 0012; and Figures*).

Shukh et al. fail to disclose the limitations “the direction of the magnetization of said soft magnetic layer is along the radius of said nonmagnetic substrate and is oriented towards the periphery of the substrate or towards the center of said nonmagnetic substrate” (claim 1) and “a magnetization of said soft magnetic layer is directed along the radius of said nonmagnetic substrate towards the periphery or the center of said nonmagnetic substrate” (claims 16 and 20), though Shukh et al. does disclose that the invention is in the form of a magnetic disk (*Paragraph 0021 - “[t]he invention is particularly suitable for use with a magnetic disc storage system”*) and that the magnetization directions are in the plane of the substrate (*Figure 3*).

However, Akiyama et al. teach a perpendicular magnetic recording medium (*col. 3, lines 16 – 34*) comprising a soft magnetic undercoat comprising multiple soft magnetic layers (*Figure 15 elements 22 and 22'*) wherein the magnetization direction is controlled to be in the radial direction in order to suppress the generation of domain walls and Barkhausen noise, as well as insuring high reproducing efficiencies (*col. 4, line 55 bridging col. 5, line 12 and Figure 15*). The Examiner notes that Shukh et al. provides a vast teaching of ways in which the orientation of the soft magnetic layers can be controlled (*Paragraph 0037*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Ikeda et al. to use a soft magnetic layer meeting applicants' claimed limitations as taught by Shukh et al. and Akiyama et al. since such a soft magnetic layer structure will suppress the generation of write field degradation, domain walls and Barkhausen noise, as well as insuring high reproducing efficiencies.

Regarding claims 2, 13, 17 and 21, Ikeda et al. teach that the soft magnetic materials used by Shukh et al. (*Paragraphs 0026 and 0034*) are known equivalent soft magnetic materials to the claimed soft magnetic compositions (*col. 3, lines 46 - 48*).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, NiFe and soft magnetic materials meeting applicants' claimed limitations are equivalents in the field of soft magnetic materials capable of use in perpendicular media. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Regarding claims 3, 4 and 8, Shukh et al. disclose embodiments meeting applicants' claimed limitations (*Figure 3 elements 50, 54 and 56 and Paragraphs 0027 and 0028*).

Regarding claims 5 - 7, Shukh et al. disclose embodiments meeting applicants' claimed limitations (*Paragraphs 0007, 0026 and 0034; wherein $Ni_{45}Fe_{55}$ is known to possess a saturation magnetization ($M_s = B_s/4\pi$) value of ~ 1.6 T and Shukh et al. explicitly teaches using materials with a $B_s > 1$ T in Paragraph 0007; see pertinent prior*

art cited in the Office Action mailed April 4, 2003– Inturi et al.). The examiner further notes that the exact thickness of the soft magnetic layers (and hence, the $B_s t$ values) are cause effective variables in terms of the magnetization force and direction (*Paragraph 0029*). It would, therefore, have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as the soft magnetic layer thickness, and hence also $B_s t$ value, through routine experimentation.

Regarding claim 12, Shukh et al. fail to disclose a hard magnetic layer meeting applicants' claimed structural and property limitations. However, Akiyama et al. teach that one can add a hard bias magnetic layer under a soft magnetic layer in a perpendicular recording medium (*Figure 5, element 25 and col. 10, lines 4 – 12*) resulting in exchange coupling with the soft magnetic layer adjacent to the hard bias magnetic layer in order to suppress the occurrence of domain walls and spike Barkhausen noise (*col. 10, lines 13 – 24*), thereby meeting applicants' claimed limitations. It would therefore have been obvious to one of ordinary skill in the art at the time of the applicants' invention to modify the device of Shukh et al. to include a hard magnetic layer meeting applicants' claimed limitations as taught by Akiyama et al. in order to suppress the occurrence of domain walls and spike Barkhausen noise.

Regarding claim 14, Shukh et al. disclose structures meeting applicants' claimed limitations (*Figure 3 – element 52*).

Regarding claims 23 and 25, Ikeda et al. disclose orientation control layers meeting applicants' claimed material limitations ("*NiAl*").

8. Claims 15 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. in view of Shukh et al. and Akiyama et al. as applied above, and further in view of Tang et al. (U.S. Patent No. 5,750,270).

Ikeda et al., Shukh et al. and Akiyama et al. are relied upon as described above.

None of the above disclose oxidized soft magnetic layers.

However, Tang et al. teach that soft magnetic layers for perpendicular media can be annealed under oxygen, thereby necessarily oxidizing the surface of the soft magnetic underlayer, in order to reduce the media noise (*col. 17, line 45 bridging col. 18, line 20*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Ikeda et al. in view of Shukh et al. and Akiyama et al. to oxidize the surface of the soft magnetic layer as taught by Tang et al. in order to reduce the media noise.

9. Claims 22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. in view of Shukh et al. and Akiyama et al. as applied above, and further in view of Sugita et al. (U.S. Patent No. 4,687,712).

Ikeda et al., Shukh et al. and Akiyama et al. are relied upon as described above.

None of the above disclose an orientation control layer meeting applicants' claimed thickness limitation.

However, Sugita et al. teach the importance of controlling the thickness of the non-magnetic layer(s) between the soft magnetic underlayer and perpendicular magnetic layer in order to improve the c-axis orientation of the magnetic layer (*col. 3, lines 31 – 40; col. 5, lines 9 – 16; embodiment 2; and Figure 9*). The Examiner deems that it would have been obvious to one having ordinary skill in the art to have determined the optimum value of a results effective variable such as the thickness of the orientation control layer through routine experimentation, especially given the teaching in Sugita et al. regarding the desire to keep the thickness of the layer(s) between the soft magnetic layer and the perpendicular magnetic layer to a thickness of about 50 nm or less. *In re Boesch*, 205 USPQ 215 (CCPA 1980); *In re Geisler*, 116 F. 3d 1465, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); *In re Aller*, 220 F.2d, 454, 456, 105 USPQ 233, 235 (CCPA 1955).

10. Claims 16, 17, 20, 21, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. ('670 B1) in view of Sugita et al. ('712) and Akiyama et al. ('342).

Regarding claims 16 and 20, Ikeda et al. disclose a magnetic recording medium (*Title*) comprising, in sequence, on a nonmagnetic substrate (*Figure 1, "Substrate"*), at least one soft magnetic layer ("*soft underlayer*"), an orientation control layer ("*NiAl*"), a nonmagnetic intermediate layer ("*Ti*"), and a perpendicular magnetic layer having an axis of easy magnetization which is oriented mainly perpendicularly to the nonmagnetic substrate ("*CoCr granular layer*" and "*Co/Pt multilayer*" and *col. 2, lines 6 – 41*).

The limitation(s) “wherein said orientation control layer is provided to control the orientation of the perpendicular magnetic layer” and “said nonmagnetic intermediate layer is provided ... to improve the orientability and the coercive force of the perpendicular magnetic layer” are (an) intended use limitation(s) and are not deemed further limiting in so far as the structure of the product is concerned. Note that “in apparatus, article, and composition claims, intended use must result in a **structural difference** between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. ***If the prior art structure is capable of performing the intended use, then it meets the claim.*** In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art.” [emphasis added] *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963). See MPEP § 2111.02. In the instant case, Ikeda et al. teach that these layers are provided to encourage the perpendicular crystalline anisotropy of the magnetic layer and, therefore, the Examiner deems that the disclosed layers meet the claimed intended use limitations.

The nominal apparatus element “a magnetic head for carrying out recording and reproducing of information to and from the magnetic recording medium” is disclosed by Ikeda et al. (*col. 3, line 24 bridging col. 4, line 7*).

Ikeda et al. fail to disclose a soft magnetic underlayer meeting applicants’ claimed limitations.

However, Sugita et al. teach a soft magnetic layer meeting substantially all of the claimed limitations, except the direction of magnetization of the soft magnetic layers, wherein the use of such a soft magnetic underlayer yields a perpendicular magnetic recording medium having excellent short wavelength recording and reproducing characteristics (*entire disclosure, especially Figures*).

Sugita et al. fail to disclose the limitations "the direction of the magnetization of said soft magnetic layer is along the radius of said nonmagnetic substrate and is oriented towards the periphery of the substrate or towards the center of said nonmagnetic substrate" (claim 1) and "a magnetization of said soft magnetic layer is directed along the radius of said nonmagnetic substrate towards the periphery or the center of said nonmagnetic substrate" (claims 16 and 20), though Ikeda et al. does disclose that the invention is in the form of a magnetic disk (*Title*).

However, Akiyama et al. teach a perpendicular magnetic recording medium (*col. 3, lines 16 – 34*) comprising a soft magnetic undercoat comprising multiple soft magnetic layers (*Figure 15 elements 22 and 22'*) wherein the magnetization direction is controlled to be in the radial direction in order to suppress the generation of domain walls and Barkhausen noise, as well as insuring high reproducing efficiencies (*col. 4, line 55 bridging col. 5, line 12 and Figure 15*). The Examiner notes that one of ordinary skill in the art would appreciate that there are a vast variety of ways in which the orientation of the soft magnetic layers can be controlled.

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Ikeda et al. to use a soft

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magnetic layer meeting applicants' claimed limitations as taught by Sugita et al. and Akiyama et al. since such a soft magnetic layer structure will have excellent short wavelength recording and reproducing characteristics and will also suppress the generation of domain walls and Barkhausen noise.

Regarding claims 17 and 21, Ikeda et al. teach that the soft magnetic materials used by Sugita et al. (*permalloy* - *NiFe*) are known equivalent soft magnetic materials to the claimed soft magnetic compositions (*col. 3, lines 46 - 48*).

Regarding claim 24, Sugita et al. teach the importance of controlling the thickness of the non-magnetic layer(s) between the soft magnetic underlayer and perpendicular magnetic layer in order to improve the c-axis orientation of the magnetic layer (*col. 3, lines 31 - 40; col. 5, lines 9 - 16; embodiment 2; and Figure 9*). The Examiner deems that it would have been obvious to one having ordinary skill in the art to have determined the optimum value of a results effective variable such as the thickness of the orientation control layer through routine experimentation, especially given the teaching in Sugita et al. regarding the desire to keep the thickness of the layer(s) between the soft magnetic layer and the perpendicular magnetic layer to a thickness of about 50 nm or less.

Regarding claim 25, Ikeda et al. disclose orientation control layers meeting applicants' claimed material limitations ("*NiAl*").

11. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. in view of Sugita et al. and Akiyama et al. as applied above, and further in view of Tang et al. ('270).

Ikeda et al., Sugita et al. and Akiyama et al. are relied upon as described above.

None of the above disclose oxidized soft magnetic layers.

However, Tang et al. teach that soft magnetic layers for perpendicular media can be annealed under oxygen, thereby necessarily oxidizing the surface of the soft magnetic underlayer, in order to reduce the media noise (*col. 17, line 45 bridging col. 18, line 20*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Ikeda et al. in view of Sugita et al. and Akiyama et al. to oxidize the surface of the soft magnetic layer as taught by Tang et al. in order to reduce the media noise.

Allowable Subject Matter

12. The following is a statement of reasons for the indication of allowable subject matter: claims 26 – 29 are directed to a perpendicular magnetic recording medium possessing a soft magnetic underlayer having a multilayer structure, wherein the direction of magnetization of an upper soft magnetic layer is different from a direction of magnetization of a lower soft magnetic layer, the direction of magnetization being along the radius of said substrate and an additional magnetic stabilization layer comprising a soft magnetic layer formed on the perpendicular magnetic layer. The combined

limitations are deemed to be neither anticipated nor rendered obvious by the prior art of record.

Response to Arguments

13. The rejection of claims 1 – 8, 10, 12 – 17 and 19 - 25 under 35 U.S.C § 103(a) – Shukh et al. in view of various references

Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

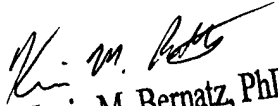
Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M. Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on (571) 272-1284. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMB
December 16, 2005


Kevin M. Bernatz, PhD
Primary Examiner